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Investigation on the Semiconducting Properties of $NiO \cdot Cr_2O_3$ Solid Solution

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Semiconducting properties of $NiO \cdot Cr_2O_3$ and its solid sotution were studied. The samples were prepared by sotid state reaction of an intimate mixture of purified NiO and Cr_2O_3 powders used as starting material. Chemical analysis, microscopic observation, X-ray analysis and measurement of electrical conductivity and thermoelectromotive force were carried out for these samples.

$NiO \cdot Cr_2O_3$ was found to dissolve nearly 12 mol % of NiO at 1300°C. Mechanism of the dissolutions was seemed to be explained by formation of vacancies in 16 d site up to 6 mol % NiO, and by the replacement of Cr ion with Ni ion from 6 to 12 mol % of NiO.

Cr_2O_3 doesn't dissolve into $NiO \cdot Cr_2O_3$ appreciablly up 1300°C, but the solubility reaches to nearly 3 mol % at 1800°C.

Electrical conductivity of the solid solution increases as the content of dissolved NiO increases and this solid solution is a P-type semiconductor.

Jahn-Teller distortion of the solid solution decreases as the content of dissolved NiO increases and tetragonality approaches toward 1.

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